DOCUMENT RESUME

ED 162 516 FL 009 840

AUTHOR Vihman, Marilyn May
TITLE From Pre-Speech to Speech: On Early Phonology. Papers and Reports on Child Language Development, No. 12.
INSTITUTION Stanford Univ., Calif. Dept. of Linguistics.
PUB DATE Dec 76
NOTE 15p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Case Studies; Child Development; *Child Language; *Cognitive Development; Cognitive Processes; *Cognitive Style; Estonian; *Language Development; Language Processing; Language Research; Parent Child Relationship; Phonological Units; *Phonology; Psycholinguistics; Verbal Development; Verbal Stimuli; *Vocabulary Development
IDENTIFIERS *Piaget (Jean); Preverbal Development

ABSTRACT

A discussion of word acquisition rates and strategies is based upon a 6-month case study of an Estonian-speaking child who gradually and systematically relaxed phonotactic constraints to allow greater complexity in word production. In addition to the cognitive tools of assimilation and accomodation as described by Piaget, the child used a further filtering process or "avoidance strategy" in which she eliminated as noise those stimuli which would overtax her capacities for identifying, processing, storing, and producing new structures. An analysis of the adult models for the child's first 50 words revealed an avoidance strategy both in the restricted phonotactic sequences (vowel-vowel and consonant-consonant) in any single word and in the limited inventory of segments found in these words. The data suggest that by the time a child begins to spontaneously produce words with adult models, he has some rudimentary knowledge of the adult sound system beyond that which he can himself produce. The study includes tables depicting word acquisition rate by month, a "boldness graph" in terms of departures from adult models, and the percent of accomodation vs. assimilation in 10-word acquisition periods. An appendix lists the child's first 50 words. (EJS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED162516

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Eve Clark, PRCLD
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

FROM PRE-SPEECH TO SPEECH: ON EARLY PHONOLOGY

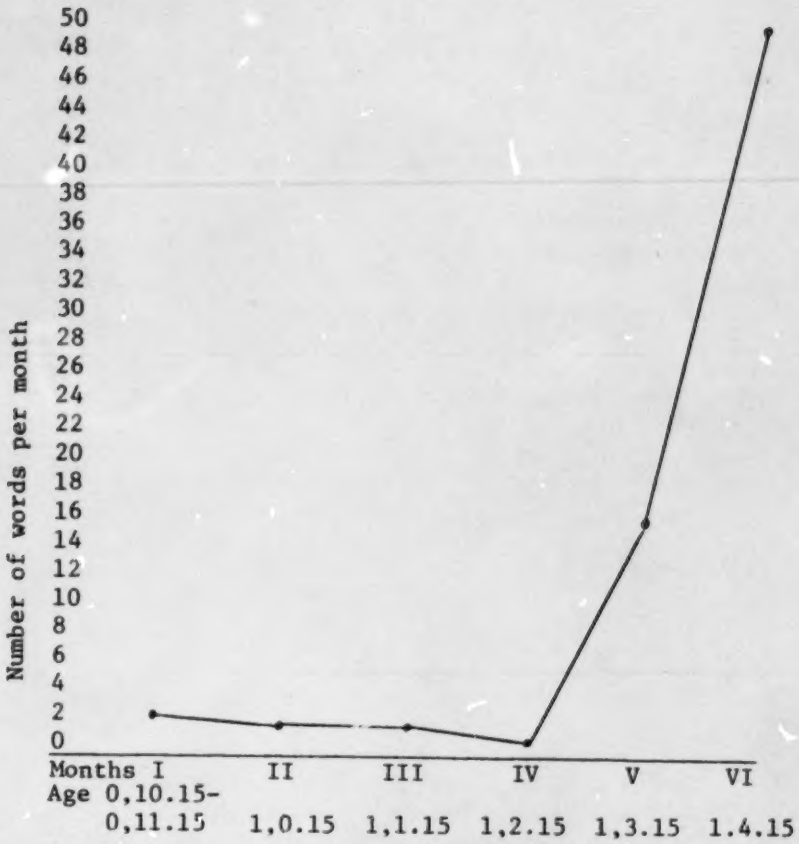
Marilyn May Vihman
Stanford University

FL009840

It is a well-known fact that a child's first words generally emerge over a fairly extended period, typically with a sharp increase in the rate of acquisition at some point (see, for example, McCarthy 1954, pp. 526f.; Nelson 1973, p. 36). Bates (1974) has explained this process as a reflection of the child's cognitive development. The earliest words are not true referential or symbolic language for the child, though they may well persist in the child's vocabulary and later be functionally reanalyzed to take their place alongside more mature acquisitions. Rather, they are specialized or stereotyped elements which form a part of certain set routines, such as greeting, leave-taking, giving and receiving. These routines are not themselves necessarily recognized by the child in their most general form. Thus, a word used for greeting or leave-taking, for example, may be confined to a single person in a single setting. When the child's cognitive level advances to the point that he begins to engage in symbolic play and to display a memory for the location of absent objects, he will begin to use language in a new way. Words can now in some sense be understood as symbols; at this time a rapid increase in the child's vocabulary usually occurs, accompanied often by an evident interest in learning the names of objects. We can cite here, for example, Velten's comment regarding his daughter at what he called the "deictic or za stage", when, upon eliciting from him the name of the object 'clock', she would take him by the hand "and insist on inspecting every time piece in the house and on having the name repeated before each one. She does not use the name herself...until, toward the end of this stage, she suddenly blossoms out with a large active vocabulary" (p. 84). Velten further notes that from the end of this period on, his daughter began to "use anything for any purpose...rock a toothbrush to sleep, put a shoe in the oven to bake", etc. One could not hope for a more eloquent illustration of Bates' thesis, itself an elaboration of Piaget's work, to the effect that language acquisition begins in earnest only when the child has entered the stage of symbolic representation.

If my own daughter Virve's (V's) word-acquisition rate is charted, (based on consistently meaningful spontaneous production of words with evident adult models), the picture strikingly resembles that described for Joan Velten, though the time period involved is somewhat compressed. Velten's child acquired some 30 words over a period of 10 months at a roughly even rate, before she suddenly blossomed out with a large active vocabulary. The Estonian-speaking subject of my own diary study acquired her first ten words over a period of four months, or at an average rate of one word every twelve days or so, while her next ten words emerged in less than a month, at an average rate of one every other day.

Table 1
Acquisition rate



There are other bits of evidence of cognitive change over this period--change, in particular, in the nature of V's attention to language. At just under eleven months, for example, she began to use a pointing gesture and at the same time to make use of a new word, her third, [se] 'this, that'.[1] The two new behaviors emerged quite suddenly and simultaneously; to all appearances the pointing and the "word" were a single action-unit to the child. Three and a half months later, after acquiring five more words, V began to use the pointing routine to ask intensively and quite systematically for names. While nursing, for example, she would point repeatedly to her mother's nose, eyes, mouth, ears, hair, the mirror behind mother, the clock and book on a table nearby. A favorite occupation at this time was leafing through an old Blue Chip catalogue. After gazing for some time at all the objects, she would bring the book to an adult and begin to point and ask, "Se? se? se?". Two weeks later, when she had produced ten words, she first exhibited dramatically a kind of behavior which I now recognize as a counterpart of the clock episode which Velten described. I quote from my diary:

[1] The full list of V.'s first fifty spontaneous productions, plus imitations recorded over that period, may be found in the Appendix. Estonian adult forms are cited in orthographic writing (underlined) in the te t; the phonemic shape is found in the Appendix, together with the phonetic shape of the child version.

> Seeing a picture of a monkey in a book, V shyly attempted to imitate the word ahv 'monkey', which I then repeated several times. Suddenly, she ran off to get a monkey-puppet she had left on a bed some time earlier. She brought it to me, very excited, and insisted on my returning repeatedly to the page with the monkey picture. Finally she placed the puppet right on the page next to the picture.

I take such behavior, in the Velten case as in this one, as evidence that the child has come to recognize the notion that a name applies to a type of which many different tokens may serve as exponents. In V's case, analogous instances of her going to some length to collect toy animals or other objects bearing the same name accumulated with increasing frequency over the next three or four weeks, until the novelty of the idea wore off. The first such instance occurred, just as with Joan Velten, immediately before a real "blossoming out" of active vocabulary took place--and just after her first purely referential, spontaneous use of a word--namely, habe 'beard'. She first imitated it, in reference to a bearded man in a picture, then applied it spontaneously, with a pointing gesture, to her father's beard; about two weeks later she spontaneously produced the word while pointing to a bearded King on a playing card.

If we accept the hypothesis that early linguistic development is closely tied to cognitive maturation (which Piaget claims follows a single immutable course in all children) we need not view the initial acquisition of words as an inexplicable marvel that can only be predicated on an elaborate innate human preparedness for language. Instead, we can look to the general mental capabilities of the child to understand how he is able to clear a path through the mass of verbiage offered by his caretakers and begin to construct a system of sound-meaning relationships of his own--a system which, in time, will come to match more closely the adult system to which he has been exposed. To turn more specifically to phonology, one might look for a difference between the kind of sound system reflected by the words the child uses first, and that which begins to emerge at the period of "breakthrough" into the cognitive stage of symbolic representation, with its usual corollary, a steep increase in word acquisition rate. The phenomenon of "progressive idioms", for example, as illustrated by Hildegard Leopold's sophisticated early pronunciation of pretty, might conceivably be related to a pre-systematic stage in phonological development, with success in achieving more or less sophisticated replicas of an adult model depending, at this point, less on a child's cognitive organization of the sounds he is hearing and beginning to acquire, than on his individual early articulatory and mimetic skills. Such a pre-systematic stage may be demonstrable for some children; in V's case, no such division into phonological stages corresponding to pre- and post-symbolic cognitive stages seemed to obtain.

What I did observe was clear use on V's part of an "avoidance strategy", a strategy of "great selectivity...in picking the words she will attempt to say" (Ferguson and Farwell 1975, p.433), of only attempting to replicate adult words which she perceives as falling within the range of sounds she can cope with to some extent.[2] Such a strategy--which I shall depict in some detail--must reflect an inner organization of the sound system on the child's part. In other words, the child must have his own "schema" or mental organization of the sounds and sound sequences or syllable shapes that he is hearing. In order to enlarge the active repertory he starts with, he has two general cognitive tools at his disposal: assimilation and accommodation. These tools, which, according to Piaget, he has been making use of from birth to expand his cognitive horizons, serve exactly the same functions now: "assimilation" means the reduction of complex stimuli to the dimensions of an existing mental schema, while "accommodation" is the expansion of an existing schema to encompass more complex stimuli. The child will make primary use of now one process, now the other, thereby maintaining relative mental stability while at the same time growing and changing as he accepts new phonological structures a few at a time. I see the avoidance strategy--in more positive terms, selection strategy--as the product of a further filtering process, in which the child eliminates as "noise" those stimuli which he perceives as beyond his range--stimuli which would overtax his capacities for identifying, processing, storing, and producing new structures.

Analysis of the adult models for V's first fifty words reveal the use of an avoidance strategy on V's part both (1) in the restricted phonotactic sequences (vowel-vowel and consonant-consonant) in any single word, and (2) in the limited inventory of segments found in these words. As regards (1), the phonotactic constraints governing V's production throughout this period were: (a) Let two syllables be the maximum word length; (b) hold place or manner constant for consonants across a word; (c) let the second vowel be identical to, or less open than, the first vowel; (d) let the two vowels agree in backness if the first vowel is not /a/. Adult forms violating these constraints were rarely attempted.

As an example of (2), no sonorants whatsoever occurred within the first twenty words. Nasals first appeared within the next ten, and were accurately replicated from the first attempts. The three Estonian non-low vowels which disagree is backness and rounding (two front rounded and one back unrounded vowel) occurred in none of the adult models for the first fifty words.[3] These segmental restrictions are gradually relaxed as the child's

[2]Ferguson, Peizer and Weeks (1973) already raised the possibility that a child may actively select adult words to attempt at least partially on phonological grounds (cf. p.44).

[3]It is true that none of these vowels are of high frequency in adult Estonian; in fact, Raun and Saareste 1965 (p.16) cite /ö/ as the rarest Estonian vowel, with a "general [lexical?] frequency of only .2%. However, several words commonly used in V's everyday experience do contain these vowels. For example, the verbs 'to eat' and 'to hit' show the same paradigmatic alternation between /ö/, /ü/, and /ë/: /sö./, /lö./ 'eat!, hit!', /sö.t/, /lö.t/ 'you are eating, you are hitting', /sei.t/, /lei.t/ 'you

experience and (perhaps) confidence grows. Within each sub-stage there are a small number of segments which the child attempts but has not yet mastered--the "emergent sounds". Thus, within the first twenty words /k/ and /æ/ appear in the adult models but not in V's productions, being replaced by [t] and [a], respectively. Of eight forms which show substitution of a different sound for some adult segment within the first 20 words, all but one involved either /k/ or /æ/; /u/, on the other hand, first appears in an adult model word about midway through this period (thirty-first word). Like the nasals, it is accurately replicated from the first attempt.

What I have just described may be the developmental pattern of a cautious child, a child who would rather attempt only what lies within, or close to, her own range. Such a pattern was also evident, in V's case, when she learned to walk, attempting no more than two or three steps at a time for a full month, before launching into walking with relatively few falls and good confidence. Numerous other such examples could be cited from her non-verbal developmental course.

If it is true, as my data suggest, that a child may refrain from attempting to produce sounds and sound-sequences unless they fall within, or, as in the case of /k/ and /æ/, just outside his range, then we have reason to believe that by the time a child begins to spontaneously produce words with adult models, he has some rudimentary knowledge of the adult sound system beyond that which he can himself produce. In the present case there is also some evidence of advances in this passive knowledge, based on perceptual confusions, where V reacted to one member of a pair of similar-sounding items as if it were the other (all arose in spontaneous interaction with the child; there were no experimental controls). These confusions, which happened to be recorded in the period extending from production of the tenth word to that of the fortieth, exhibit a clear developmental trend, the early pairs having no more in common than a general gestalt, such as "labiality" or, in Waterson's sense, "rounding" (cf. puu 'tree' and piima 'milk', habe 'beard' and vʉʉ 'belt'), whereas the later pairs are close enough to be confused by an adult under poor listening conditions (cf. leht 'leaf' and lehm 'cow', kortsu 'wrinkled' and kutsu 'doggy', kurg 'crane' and kukk 'rooster', pell 'apron, bib' and polv 'knee'). Such a progression seems to indicate that the child's capacity to perceive and analyze adult forms is a developing skill, not fully present from the beginning. Yet it is also apparent that the child is able to focus on and clearly register certain forms which lie within his productive range even before entering the Piagetian stage of symbolic representation. Otherwise we could not explain V's successful replication, mentioned earlier, of the word see 'this, that', at just eleven months (the word was segmentally quite acceptable; only the length contour failed to correspond to adult expectations).

(ftnt. 3 continued)

ate, you hit (past)', /sʉ.a/, /lʉ.a/ 'to eat, to hit'. (See the Appendix for the conventions used here in writing Estonian phonemically.) Drawing on the active vocabulary of about 275 words reported for another Estonian child by the end of her second year (Vihman 1971, pp. 88-94), we find three words containing /ʉ/, seven with /ʊ/, and eleven with /ʉ/. V herself produced one word with /ʉ/ (in the adult model), four with /ʊ/, and three with /ʉ/ by the time her active vocabulary had reached 160 words.

To say that early lexical choices are, at least in part, phonologically governed is not, of course, to deny a role to meaning. Some words are semantically more significant for the child than others, and some situations are referred to or "named" by almost every child at an early stage. Such situations include pointing, with some deictic term from the adult language usually being adopted, and giving or taking, with a variety of child labels including words such as 'here, give, thank you', etc., which belong to quite different domains in the adult language (cf. Bates 1974, Nelson 1973). But in choosing a term to express interest or participation in a given situation the child has some discretion: adults routinely use a number of different words under the same general circumstances. Use of this discretion to pick words that he can reproduce relatively accurately may depend on the child, his personality or the extent to which his articulatory skills are keeping pace with his cognitive development (the children reported on by Weeks (1974) and by Velten (1943) show a much greater discrepancy between these different developmental parameters than did the child under discussion here). In V's case, a degree of caution in linguistic matters may be further evidenced by the almost complete absence of semantic over-generalization. A single exception was her word [kɔ̰kɔ̰], first used at 14 months to refer to cookies or crackers, then extended to demand food in general and even, on just one occasion, to ask to nurse.

An anecdote may serve to illustrate the role of sound in lexical choice. First, note that the non-linguistic sentimental literature strongly suggests that words for 'mama' and 'papa' will be found to occur early in a child's linguistic repertory. As McCarthy pointed out in 1954,

> there are a number of difficulties surrounding the determination of the exact age at which the child uses his first word...This event is so eagerly anticipated by parents that they often read meaning into the child's early babblings which happen to coincide with the presence of certain persons, objects, or events in the environment. If the child habitually uses da-da in his babbling, and sometimes uses it in the presence of his father, when can it be said that "Daddy" is uttered to designate his father? (p. 523)

In V's case, the first word, in retrospect, was probably [hai] 'hi!' (in English), though at the time I protested when Americans exclaimed at her answering 'hi!' to their greeting. She never heard 'hi' at home, where only Estonian was spoken, and I was inclined to disregard any evidence that she was using English first. This is the reverse of the usual case, described by McCarthy and typified by the account a friend of mine gave of her son's use of the "word" dada: "It means daddy, and all good things, like flowers, sunshine, etc."

V's syllable babbling period began, like her later pointing behavior, rather abruptly, at about seven and a half months. I had been remarking on her failure to utter any syllables, when suddenly one day she began practicing, in a soft voice, a series of syllables consisting of a dental or velar nasal or voiced stop, followed by a very front [a]: [na, na, na...], [ŋa, ŋa, ŋa...], [da, da, da...], rarely [ga, ga, ga...]. This remained her sole inventory for several weeks. However, the only words normally

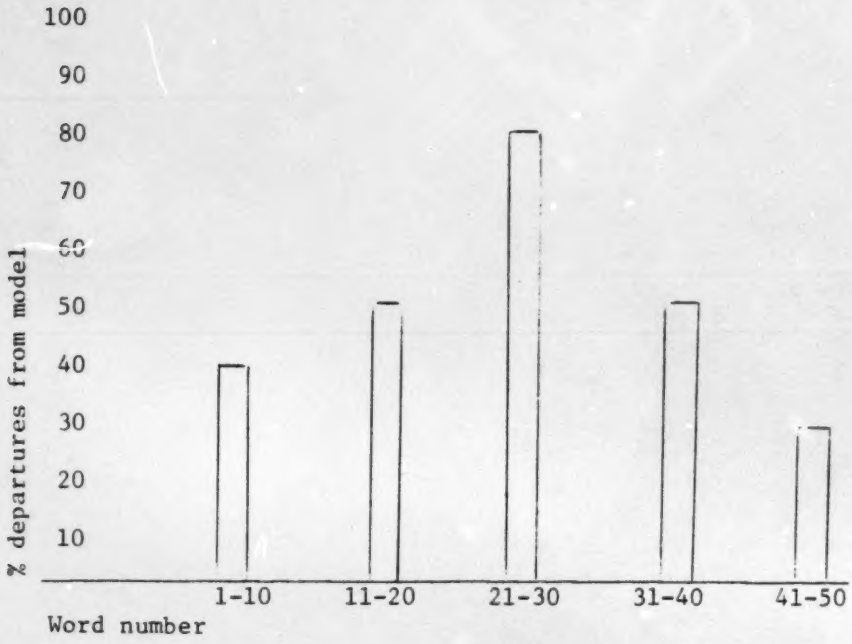
used for 'mother' and 'father' in Estonian are ema and isa, respectively, so there was no temptation to interpret [da, da] as 'daddy' in our case. In fact, word-initial voiced stops do not occur in adult Estonian, even in the baby talk register. These babbled syllables eventually faded away, though V did continue to engage in babbling for some months after she had begun producing her first replicas of adult words.

The words that do serve to name 'mother' and 'father' in Estonian proved difficult for V, since they violated one of her selection constraints on possible sound sequences, namely, that if a word contains two different vowels, the first must be the more open. The word for 'father', isa, appeared early in a truncated form, minus the initial stressed vowel: [sa] or [sɔ]. But this form ceased to be used after a short time. Starting somewhat later, both mother and father made earnest attempts to elicit the words ema and isa, repeatedly pointing to each member of the family and clearly naming 'mother', 'father', and 'baby'. At fifteen months, almost four months after the first attempts to use isa, V began to use the word beebi 'baby' to refer to herself; ema emerged as [ami] or [ani] only two weeks later, at which time isa also reappeared, now pronounced [asi], and the word liha 'meat' was reproduced, following the same substitution rule, as [ati]. Apparently the desire to use a term for 'mother' and 'father'--not to speak of the weight of parental pressure to do so--had become great enough to force V to find a way around her constraints on possible words to say. The ingenious solution, vowel metathesis, challenged the listener's ingenuity as few of this child's early words had, but repeated use in clear contexts enabled her to put her meaning across.

If we look closely at the relationship between adult and child forms for these first fifty words, we find that 27 words, or over half, show no errors, or only errors of omission by the child. That is, the segmental make-up of the child form matches that of the adult model (in 16 words), or matches it except for a missing element: vowel, consonant, or entire syllable (11 words). These forms, which thus make up 50% of the child's spontaneous production of different word-types over her first six months of language use, are, in my view, the result of careful selection--i.e., of the avoidance strategy. Whether or not the child in fact perceived the missing elements is of course a moot point. But clearly these words seemed to her to be pronounceable, to be close enough to her skills to be worth attempting. In other words, V was in some sense checking the words she heard often against a filter representing her own production skills: possible feature combinations, syllable structures, segment sequences.

A kind of "boldness" curve emerges from these data if we score the percentage of words attempted with no error or only errors of omission, as against those which show substitutions (sometimes in addition to omissions): The latter were the "hard words". This curve shows that the child was relatively cautious or conservative at first (only 40% departures from the adult model), that she reached a height of daring in the period of production of words 21 to 30 (fully 80% departures), and that she was going through another apparently cautious stage at the end of this period (only 30% departures). To evaluate this curve more realistically, however, we should remember that to start with the child had no more than a babbled syllable repertory, and that the first ten words were produced over a period of four months. By the time of the last ten, her repertory had grown considerably and the period covered is no more than a day and a half, so that to call this a "stage" at all is rather misleading.

Table 2. Boldness graph



How does the child arrive at the more advanced repertory represented by the later acquisitions? Obviously an "avoidance" or "selection strategy" is only a kind of holding operation, to keep the task of acquiring phonology within manageable bounds. There must be other strategies to enable the child to expand his repertory, strategies which will also account for the "bolder" advances made by the child, such as that illustrated by the acquisition of the Estonian words for 'mama' and 'papa', which showed quite a radical departure from the adult model--though not from the child's existing phonotactic constraints.

This distinction--between departures from the adult model, on the one hand, and adjustments in the child's own system, on the other--is an important clue to the child's progression. Given an adult target word which does not fully conform to the child's existing segment inventory or set of phonotactic constraints, he has two options, as suggested earlier. He can respond to the challenge with either "assimilation" or "accommodation" (or some combination of the two). Assimilation, the adaptation of "the world" to the child's schema, means in this case adjustment of the adult model to conform to the child's restrictions. Application of metathesis to derive [ami] from ema and [asi] from isa is a good example of this. Another is V's treatment of /k/. At first she avoided words containing /k/ in her spontaneous productions--though she was in fact fascinated with the sound throughout her fourteenth month, as evidenced by persistent efforts to imitate words containing one or especially two /k/'s (the imitation consisting generally of heavily aspirated [k]'s with no intervening vowel sound, or of [k] followed by a voiceless low back rounded vowel: [kɔ̥kɔ̥]). Her first spontaneous production of a /k/-word was [tit·i:] for kikerikii 'cock-a-doodle-doo', with substitution of [t] for /k/, at the end of the fourteenth month. One month later she began to produce spontaneously an isolated word containing [k] + a vowel in her version--but this was simply the same repeated [k] + voiceless low back rounded vowel syllable sequence--[kɔ̥kɔ̥]--that she had used earlier in imitating words with two /k/'s in them.

The model was apparently English cookie or cracker, perhaps blended as well with Est. kook 'cake'. Substitution of [t] for /k/ continued in all other cases, before /a/ as well as before front vowels, for two more months, at which time she suddenly produced several words with initial [k].

The treatment of /k/, after an initial period of avoidance, was one of assimilation of the adult sound to the child's system--i.e., change of /k/ to [t], or of a series of /kV/ syllables to [kɔkɔ]--until she was finally ready to accommodate her system to the adult's, by producing the adult sound itself. The other option, accommodation, or a relaxing of one or another of the early restrictions in the child's sound system to allow greater complexities in her productions, may be illustrated by V's slow phonotactic advances:[4] V at first produced disyllabic words only if they contained at most one consonant in the adult model as well as in her replica (e.g., aitɜ̈h 'thanks', pai 'pat (kitty)', habe 'beard'). She then began to attempt words with two or more instances of the same consonant (like kikerikii 'cock-a-doodle-doo', cookie, tɜ̈di 'auntie, woman'). Finally she began producing words which contained two or more different consonants, but still with either place or manner harmony across the word, at least in her version (cf. kinni 'closed', which V rendered as [tin], tantsi 'dance'). The gradual acceptance of a wider range of adult models may well be regarded as a step-by-step accommodation or adjustment of her schema to match the world.

Table 3 sums up in percentual terms V's use of the two processes at various points over the period of acquisition of her first fifty words.

Table 3. Percent of accommodation vs. assimilation in 10-word acquisition periods

Word no.	Accommodation alone	Assimilation alone	Both	Neither
1-10	30%	--	70%	--
11-20	20%	40%	30%	10%
21-30	--	30%	60%	10%
31-40	30%	40%	20%	10%
41-50	10%	30%	20%	40%
overall: 1-50	18%	26%	40%	16%

44% one process alone

Such a see-saw-like progress enables the child to gradually learn to produce the full range of adult sounds and sound sequences, without overtaxing his own system at any given moment. The learning process is seen here to be no different from that which obtains in other domains of the child's experience; the structural tools with which he is endowed in this model are those he has used for cognitive growth, according to Piaget, throughout his life.

[4] For another case study of a child who gradually and quite systematically relaxed his phonotactic constraints to allow greater complexity in word production, see Macken (1976). For a somewhat different account of early phonotactic progress, see Moskowitz (1973).

Appendix

The Data: V's First Fifty Words

Key:

- * word used only in direct imitation
- ** word first produced as imitation, then used spontaneously within next few days
- D ephemeral form, discontinued after short period of use
- O onomatopoeic form

Numbered forms are those included in the 50-word count and analysis: all spontaneous productions, exclusive of onomatopoeic forms not used referentially.

Underlined form = English adult model

Estonian phonemic transcription:

- upper case letter — long (and tense) segment
- · — intense (or "overlong", "accented") syllable (see Vihman 1974)
- \- — compound word boundary

Primary stress on initial syllable unless marked elsewhere

Long:short (tense:lax) contrast neutralized in word-initial consonants

Syllabic intensity occurs only on long stressed syllables. Long syllable = syllable whose nucleus contains a long V, or is followed by a long C, or contains a diphthong or vowel-continuant sequence, or any combination of these.

Stress monosyllables (whether free or in compound word) always bear syllabic intensity.

Phonetic transcription (child forms):

- C+ released consonant
- V voiceless vowel

- C:, V: "overlong" segment
- C·,V· long segment

- | temporal spacing (syllabic break accompanied by slight pause)

#	Age	Child form	Adult model	Gloss
1	0,10.18	ˈhai ~ ai˧	/hay/	'hi!'
2	0,10.28	ˈte ~ teˈe ~ tete˧	/tere/	'hi, hello!'
3	0,10.29	ˌse˧	/sE./	'this, that'
4	0,11.23	sa ~ sˌ˧	/isa/	'father, daddy'
5		aita ~ aida˧	/aiTǽh./	'thanks'
6	1,1.2	ˌpai ~ bai˧	/pai./	'pat (kitty)'
	1,1.12	* k^h k^h	/ko.Ku/	'(put) together'
	1,1.13	* aiai˧	/aLo-aLo/	'hello-hello (on telephone'
		*ˌk ˌ k ˌ˧	/kaLi-kaLi/	'hug'
7	1,1.14	** ao˧	/aLo-aLo/	'hello-hello'
		*ˈk+ k+˧	/kuKer-paL'./	'somersault'
	1,1.16	* k+ k+ k+˧	/kaKa/	'caca'
	1,1.28	* h˧	/hopune/	'horse'
		* kik:i:˧	/kiKeriKÍ./	'cock-a-doodle-doo'
		* pun ˌ p^h p^h	/nÖ.P/	'button'
8	1,2.6	ˌtit:i:˧	/kiKeriKÍ./	'cock-a-doodle-doo'
	1,2.11	*ˌpi: ~ pw ~ pi: ~ pwi:˧	/pU./	'tree'
	1,2 13	* ap:ˌsi˧	/aPelsin/	'orange'
9	1,2.18	** apˌ˧	/hape/	'beard'
10	1,2.24	ˈkˌkˌ˧	/kúkiy, krækər/	'cookie, cracker'
		* ao ~ awo˧	/hea-t-isu/	'bon appetit'
	1,2.28	* av ~ au˧	/ah.v/	'monkey'
		* v˧	/hir.v/	'deer'
11		ˈtin˧	/ki.Ni/	'closed'
12	1,3.0	D tata ~ tai˧	/tæ ti/	'auntie, woman'

#	Age	Child form	Adult model	Gloss
	1,3.6	*ˌapwˈ	/aPelsin/	'orange'
13	1,3.7	ˌpæh	/pæh./	'icky'
14		ˌpe·pí	/pEpi/	'baby'
15	1,3.8	ˌti	/kIsu/	'kitty'
16		ˌti	/kIku/	'swing'
17	1,3.11	ˌap·i	/a.Pitu hU.Pa/	'uppy-do (Estonianized), jump'
	1,3.13	*ˌsts	/sui.ts/	'smoke'
		*ˌps	/plIat's'/	'pencil'
18		Dˌtah	/tahan, tahat/	'(I, you) want'
19		Oˌau	/auh.-auh./	'bow-wow'
		Oˌk	ˌkˌkˌk ...ˈ	'cutcutcut (hen)'
20		ˌpai	/bay(-bay)/	'bye'
21	1,3.15	ˌta si	/tantsi/	'dance'
22		ˌh	/hopune ~ hopu	'horse'
23		ˌahv	/ah.v/	'monkey'
24		ˌta tiˈ	/lah,ti/	'open'
		Oˈam:	/am,/	'yum'
		O bim:	/bum./	'boom (Estonianized)'
		O mae:	/mAE./	'baa (sheep)'
		* emːɬi	/ema/	'mother, mommy'
251	1,3.20	ˌtis	/tei.st/	'other (breast)'
		* apu s	/arpU.s/	'watermelon'
26		Dˌtis	/ˈis/	'this'
27		D tæt	/ˈæt/	'that'
28		D ati	/liha/	'meat'
29	1,3.20	ami ani	/ema/	'mother, mommy'

#	Age	Child form	Adult model	Gloss
30	1,3.20	[mi:m]	/pIm./	'milk'
31	1,3.21	[puh]	/pU./	'tree'
32		[pawawei]	/paPakoi/	'parrot'
	1,3.22	O[u ú:]	/uhÚ./	'hoot (owl)'
		O[ha]	[ha]	'hiss (goose)'
33	1,3.23	O[atsih ~ atsí]	/atsih./	'achoo'
34		[tati]	/kaLi-kaLi/	'hug'
		O[iaia ~ eia]	/ia-ia/	'heehaw (donkey)'
35		[papu]	/pravo/	'bravo'
36	1,3.27	[man·i]	/maNi/	'Manni (doll's name)'
		O[am·u:]	[am·ú:]	'moo (cow)'
		O[pæ·]	/prAE.ks/	'quack (duck)'
37		[pa·]	/par.T/	'duck'
38	1,4.11	[t:]	/ve.T/	'water'
39		[kak·a]	/kaKa/	'caca'
40		[t t·]	/klei.T/	'dress'
41		[ku·]	/kU./	'moon'
42	1,4.12	[puh]	/puh./	'Pooh'
43		[pis·]	/pis.-pis./	'wee-wee'
44		[ya·]	/yA./	'yes'
45		[ei]	/ei./	'no'
46		[kaka ~ kała]	/kala/	'fish'
47		D[sæ]	/sær.K/	'shirt'
48		[po·t'·]	/vO.ti/	'bed'
49		[po ~ pap·]	/paL':/	'ball'
50		[kæ u]	/kæru/	'wheelbarrow'

REFERENCES

Bates, Elizabeth. Language and context: The acquisition of pragmatics. Academic Press, New York. 1976.

Ferguson, Charles A. and Carol B. Farwell. Words and sounds in early language acquisition. Language 51.419-439. 1975.

Ferguson, Charles A., David B. Peizer, and Thelma E. Weeks. Model-and-replica phonological grammar of a child's first words. Lingua 31: 35-65. 1973.

Macken, Marlys A. Permitted complexity in phonological development. PRCLD 11. 28-60. 1976.

McCarthy, Dorothea. Language development in children. In L. Carmichael, (ed.) Manual of Child Psychology. New York. 2nd ed. 1954.

Moskowitz, Arlene I. The Acquisition of phonology and syntax. In Hintikka et al., eds.) Approaches to Natural Language. 1973. Dordrecht, Holland: D. Reidel.

Nelson, Katherine. Structure and strategy in learning to talk. Monographs of the Society for Research in Child Development 38. 1973.

Raun, Alo and Andrus Saareste. Introduction to Estonian Linguistics. Ural-Altaische Bibliothek. 12. Wiesbaden: Otto Harrassowitz. 1965.

Velten, H. V. The growth of phonemic and lexical patterns in infant language. Language 19. 281-292. 1943. Reprinted in Aaron Bar-Adon and Werner F. Leopold, (eds.) Child Language: A Book of Readings. Englewood Cliffs: Prentice-Hall. 1971.

Vihman, Eero. Estonian quantity re-viewed. Foundations of Language 11. 415-432. 1974.

Vihman, Marilyn M. On the acquisition of Estonian. PRCLD 3. 51-94. 1971.

Waterson, Natalie. Child phonology: a prosodic view. Journal of Linguistics 7. 179-211. 1971

Weeks, Thelma E. The Slow Speech Development of a Bright Child. Lexington, Mass.: D. C. Heath. 1974.